

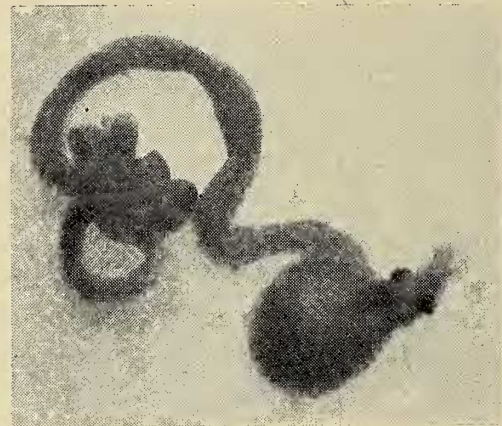
# Notes on *Tetrameres* sp. (Nematoda, Spiruroidea) Parasitic in the English Sparrow in Hawaii

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WHILE ENGAGED by the University of Hawaii Agricultural Experiment Station in 1947, the writer participated in a study of wild birds as possible carriers of poultry parasites. During the course of this work incidental observations were made on a species of *Tetrameres* parasitic in *Passer domesticus*. A more thorough study of this parasitic nematode was then contemplated, but it now appears that such a project may not be feasible. Since the parasite in question is undoubtedly a new species<sup>2</sup> and some worker may wish to describe it, it seems desirable that these notes be recorded to serve as a basis for future work.

In her treatise on bird nematodes, Cram (1927) listed 15 species of *Tetrameres* from various birds, but none in the English sparrow. A related parasite, *Microtetrameres inermis*, was listed as having the sparrow as a definitive host, but as far as can be determined no other information on sparrow parasites in the nematode family Tetrameridae is available in the literature.

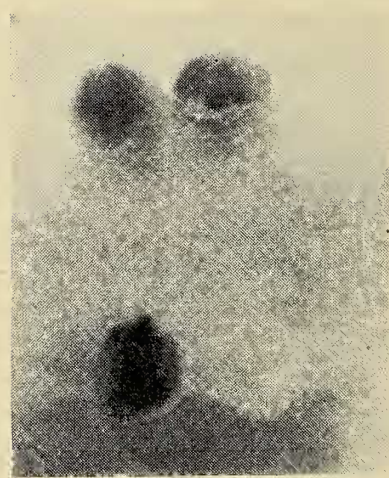
The roundworm genus *Tetrameres* is of both academic and economic interest. The nematode presents a striking sexual dimorphism in that the mature female loses its typical filiform shape after invading the glands of the proventriculus and assumes a globular appearance (Fig. 1). Also, unlike the male, the female becomes blood-red in color. It is during the invasion of the stomach



a



b



c

FIG. 1. Three females of *Tetrameres* sp. shown protruding from the outer proventricular wall of the English sparrow. a, Position of parasites in relation to gizzard and intestine; b, enlargement to show globular appearance of females; c, one female entirely free of the enveloping proventricular tissue, and other two partly imbedded.

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<sup>2</sup>In a personal communication (1948), Dr. E. E. Wehr, U. S. Department of Agriculture, Bureau of Animal Industry, expressed the opinion that ". . . the specimens from the sparrow do not closely fit the description of any known species . . . ."



glands that the most severe clinical symptoms and even death of young birds may occur. Both males and females have been noted to feed on blood, and Cram (1931) pointed out that *T. americana* causes emaciation and droopiness in young chicks.

The primary objective of the present observations was to determine if the sparrow *Tetrameres* is infective to chickens. Additional biological data on this parasite have also been recorded.

#### MATERIALS AND METHODS

English sparrows were obtained by shooting them out of trees on the poultry farm at the University of Hawaii Agricultural Experiment Station. These birds were immediately dissected. Seasonal records on parasite incidence were thus obtained from February, 1947, to March, 1948. In some cases an examination of individual proventricular glands was made and the number of male and female parasites per gland was noted.

Adult female *Tetrameres* were removed from the proventriculus and macerated in a small dish in a drop of physiological saline. Bits of

this material were fed to grasshoppers (*Oxya chinensis* and *Conocephalus saltator*). The individual hosts were subsequently dissected to check upon their experimental infections; no infected controls were found. The grasshoppers were maintained in a small screened cage and provided with various grasses from their natural habitat. Infected grasshoppers showing third stage (infective) larvae of the parasite were fed to young chicks by forcing the whole grasshopper into the crop with a long forceps.

#### DATA AND DISCUSSION

The seasonal incidence of *Tetrameres* sp. in the sparrow is shown in Table 1. These data indicate male and female infected hosts about equal in number and no apparent significant fluctuation in percentage of infection throughout the season. Nevertheless, the obvious conclusion is not justified since the age of the parasite and of the host is unknown, thus precluding any inferences on the rate of parasitic transfer from the intermediate to the definitive host. cursory inspection indicated that the majority of female parasites were

TABLE 1  
SEASONAL INCIDENCE OF *Tetrameres* SP. IN *Passer domesticus* FROM UNIVERSITY OF HAWAII  
AGRICULTURAL EXPERIMENT STATION

DATE	NO. BIRDS	NO. BIRDS INFECTED				NO. PROVENTRICULAR GLANDS INVADED		
		♀	♂	Total	%	Min.	Max.	Mean
2-8-47.....	12	3	1	4	33.3	1	10	3.3
3-1-47.....	11	2	2	4	36.3	1	2	1.5
4-3-47.....	20	5	4	9	45.0	1	3	1.8
6-5-47.....	12	1	1	2	16.6	1	2	1.5
7-8-47.....	15	1	2	3	20.0	1	2	1.5
9-10-47.....	19	3	1	4	21.0	1	4	2.0
10-20-47.....	20	1	4	5	25.0	1	10	4.2
11-14-47.....	18	3	4	7	38.8	1	6	1.9
12-14-47.....	25	4	4	8	32.0	1	4	1.5
1-16-48.....	20	4	2	6	30.0	1	9	3.0
2-10-48.....	15	2	3	5	33.3	1	6	2.0
3-21-48.....	20	7	3	10	50.0	1	8	2.1
Totals.....	207	36	31	67	22.2	1	10	2.1

TABLE 2

INCIDENCE OF *Tetrameres* SP. IN INDIVIDUAL GLANDS OF PROVENTRICULUS OF INFECTED SPARROWS

.BIRD	NO. GLANDS INVADED	NO. ADULT		NO. ♂ PER GLAND			NO. ♂ IN PROVENTRICULAR LUMEN
		♀	♂	Min.	Max.	Mean	
1.....	1	1	4	—	—	4.0	0
2.....	10	10	18	0	4	1.8	8
3.....	1	1	2	—	—	2.0	0
4.....	1	1	2	—	—	2.0	0
5.....	1	1	1	—	—	1.0	0
6.....	2	2	1	0	1	0.5	3
7.....	2	2	4	0	4	2.0	0
8.....	1	1	0	—	—	0.0	1
9.....	1	1	1	—	—	1.0	2
10.....	1	1	4	—	—	4.0	0
11.....	3	3	1	0	1	0.3	0
12.....	3	3	3	0	2	1.0	0
13.....	2	2	3	1	3	1.5	1
14.....	2	2	1	0	1	0.5	2
15.....	1	1	3	—	—	3.0	0
16.....	1	1	1	—	—	1.0	2
17.....	2	2	3	0	3	1.5	0
Totals ..	35	35	52	0	4	1.4	19

mature. Table 1 also presents some data on the number of proventricular glands invaded in the parasitized birds, the average number of invaded glands per bird being 2.1.

Individual parasitized proventricular glands were examined and it was found that no more than one female nematode per gland was the rule. The number of males varied from zero to four, with an average of about 1.4 per gland for all glands examined. Additional male worms were found in the proventricular lumen (Table 2). It should be noted that, unlike other *Tetrameres* species heretofore studied, the present form eventually reaches the outside stomach wall subsequent to its invasion of the gland from within the lumen. When a sparrow is first dissected, these globular, bright red female worms can be seen surrounded by the delicate intima of the outer stomach wall. They exert considerable pressure on this membrane, for a slight cut with a scalpel results in immediate expulsion of the female (see Fig. 1).

The mature female is nothing more than a

sac of uterine coils filled with eggs, many of which are embryonated. These embryonated eggs have polar filaments about  $12\mu$  in length, and the eggs themselves are about  $52\mu$  long by  $30\mu$  wide (Table 3).

Although the grasshoppers used here may not be the actual intermediate hosts in nature, the sparrow *Tetrameres* completed development in them. The parasite underwent two molts in these hosts—from the first to second, and second to third larval stages. The third larval stage was typically filariform and is presumed to be the infective stage for the vertebrate host. These third stage larvae were

TABLE 3

MEASUREMENTS IN MICRONS OF 25 EMBRYONATED EGGS OF *Tetrameres* SP. TAKEN FROM FEMALE UTERI

SIZE	MIN.	MAX.	MEAN
Length.....	50	55	52.2
Width.....	29	33	30.4
Length of polar filament	9	15	12.0



TABLE 4  
DEVELOPMENT OF *Tetrameres* SP. IN *Oxya chinensis* AND *Conocephalus saltator*

LARVAL STAGE	NO. LARVAE MEASURED	LENGTH IN $\mu$			WIDTH IN $\mu$			MEAN LENGTH IN $\mu$		
		Min.	Max.	Mean	Min.	Max.	Mean	Esophagus	Tail	
1.....	18	196	375	266.6	16	32	21.0	126.4	48.3	
2.....	5	388	555	473.6	28	37	33.0	170.4	70.8	
3.....	7	740	891	830.1	40	45	42.0	pre- 133.5	post- 169.4	105.5

found loosely encysted along the dorsal body wall of the grasshopper in the oenocytes and very rarely in muscle tissue. By shaking these tissues in saline, the larvae could be easily removed. Infective larvae were observed in a minimum of 21 days after embryonated eggs had been fed to a grasshopper. Development took place equally well in both species of grasshoppers. Data on development of the larvae are given in Table 4.

Attempts to transmit the sparrow *Tetrameres* to young chicks proved negative in all of 11 trials. The age of the parasites in the grasshopper hosts varied from 45 to 60 days, and the period allowed for development in the chicks was from 30 to 75 days. The parasites in the grasshoppers were checked for larval stage and viability before they were fed to the chicks; thus it would appear that this parasite is probably not infective to young chicks.

#### SUMMARY

1. An apparently new species of *Tetrameres* has been found to parasitize English sparrows in Hawaii.
2. Adult male and female parasites were

found invading the proventricular glands of sparrows throughout the year.

3. No more than one female per gland and from zero to four males with an average of 1.4 per gland were found in the proventriculus. This parasite, unlike other described *Tetrameres*, eventually protrudes from the outer stomach wall after invasion of a gland and growth within it.
4. The grasshoppers *Oxya chinensis* and *Conocephalus saltator* may serve as experimental intermediate hosts of the parasite, which reached the third larval stage in these hosts in a minimum of 21 days at room temperature.
5. Attempts to infect young chicks with third stage larvae of the sparrow *Tetrameres* failed in 11 trials.

#### REFERENCES

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- 1931. Developmental stages of some nematodes of the Spiruroidea parasitic in poultry and gamebirds. *U. S. Dept. Agr. Tech. Bul.* 227.